

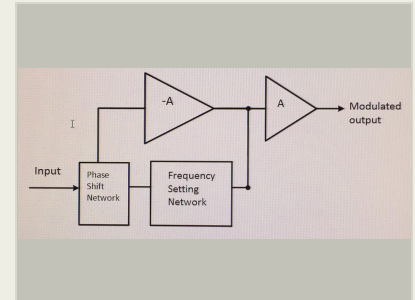
# +500C Hi-Rel Rad Hard, Rugged Modulator, Phase I

Completed Technology Project (2017 - 2017)



## Project Introduction

Chronos Technology, proposes to deliver a comprehensive, and conceptually validated feasibility study (in Phase I) for a novel compact, rugged, stable, low power, radiation hardened +500 degrees C radio frequency modulator (HTMX). The modulator would be a subsection of a transmitter used in extreme high temperature and rad-hard space applications such as in-situ atmospheric and surface explorations in the high-temperature high-pressure environment at the Venusian surface (485C, 95 atmospheres). Our intent is to complete the phase 1 study and deliver a design roadmap to the implementation and fabrication of the design in Phase 2. The proposed modulator feasibility study would also address the packaging aspect of the HTMX, its miniaturization and manufacturing processes and guidelines to facilitate reliable and repeatable device fabrication and its full adaptation to mission deployment. Our proposed solution offers compelling features such as a rugged package that would withstand atmospheric pressure in excess of 95 bar ambient pressure at +500 degrees C. The design and analysis of the HTMX configuration would include frequency scalable output, and commercially available compact package footprints. Since any hot planet lander system requires reliable communication, the frequency tolerance for HTMX will be optimized to enable reliable transmission fidelity for the Venusians in-situ surface exploration. The underlying objective in evaluating the different modulation schemes is to keep the approach simple. keeping it simple will positively impact the reliability and the eventual TRL of the proposed solution. Considering the harsh operating environment and the limited operating life for the system, we focus on a simple and reliable frequency modulation scheme. Our approach will also enable very efficient adaptation of the design to ASK (amplitude shift key) modulation as well. HTMX in itself would include other side benefit of a reliable and stable rad-hard clock source.



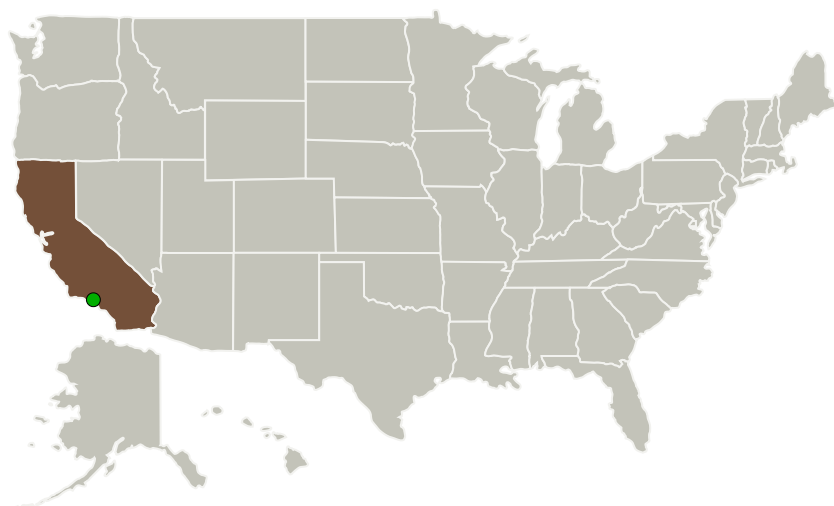
+500C Hi-Rel Rad Hard, Rugged Modulator, Phase I Briefing Chart Image

## Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Images	3
Technology Areas	3
Target Destinations	3



## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Chronos Technology (Div. of FMI, Inc.)	Lead Organization	Industry Women-Owned Small Business (WOSB)	Huntington Beach, California
● Jet Propulsion Laboratory (JPL)	Supporting Organization	NASA Center	Pasadena, California

### Primary U.S. Work Locations

California

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Organization:

Chronos Technology (Div. of FMI, Inc.)

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

Carlos Torrez

### Principal Investigator:

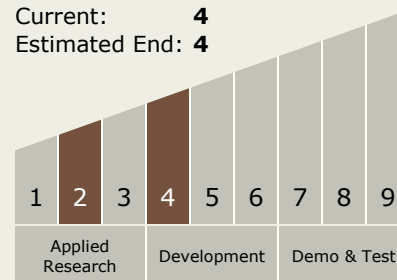
Kouros - Sariri

## Technology Maturity (TRL)

Start: 2

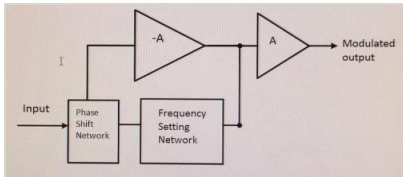
Current: 4

Estimated End: 4





## Images



### Briefing Chart Image

+500C Hi-Rel Rad Hard, Rugged Modulator, Phase I Briefing Chart Image

(<https://techport.nasa.gov/image/135363>)

## Technology Areas

### Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - └ TX05.2 Radio Frequency
    - └ TX05.2.2 Power-Efficiency

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System